Impact of Jobs-Housing Balance on Passenger Vehicle Use and Greenhouse Gas Emissions

Policy Brief

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California Environmental Protection Agency
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Policy Description

Jobs-housing balance, as a transportation policy tool, is premised on the idea that when residence and work locations are closer together, people's travel distance to and from work will be reduced. Jobs-housing balance is typically measured by the ratio of the number of jobs divided by either the number of employed residents, persons, or houses in a geographic area. Yet there is no single numerical indicator of balance, and the concept of jobs-housing balance should be sensitive to the local context. Several complicating factors when measuring the jobs-housing ratio exist, including those listed below.

- The appropriate size of the geographic area, or "commute-shed", over which balance is measured requires judgment. Areas that are too small will be out of balance even if commutes are short, while large areas (for example metropolitan areas) can be in balance even if people commute long distances.
- A focus on spatial proximity ignores the influence of traffic congestion on commute time, as spatially separated jobs and houses in uncongested locations (possibly at the urban fringe) could potentially allow faster commutes than shorter job-residence distances in more congested locations (likely closer to the urban core).
- The idea of balance, in its simplest form, ignores factors, such as school quality and other amenities, which may influence a person's decision to live distant from their nearest job opportunity. For a discussion, see, e.g., Giuliano (1991).
- Simple comparisons of jobs and housing stock or resident population ignore questions about the match between job requirements and employee skill. Jobs-housing match refines the jobs-housing balance concept to compare the skills of residents and the skill requirements of jobs within a geographic area. See, e.g., Cervero and Duncan (2006).

Impact of Jobs-Housing Balance

Effect Size

Table 1 lists research on the relationship between jobs-housing balance and VMT. The results in Table 1 are mixed, ranging from studies that find no statistically significant relationship between jobs-housing balance measures and VMT (Miller and Ibrahim, 1998) to studies that find that a 1 percent increase in jobs-housing balance is

associated with a VMT reduction between 0.29 and 0.35 percent (Cervero and Duncan, 2006; Kockelman, 1997). The studies that found a relationship between jobs-housing ratios and VMT typically found effects in the same range whether attention was focused on commute VMT or all VMT, and whether the jobs-housing balance ratio was adjusted for skill match or not. The evidence from the most recent studies, especially Cervero and Duncan (2006), is methodologically superior, and focusing on that and other studies that use data for households (see the next sub-section), the impact of jobs-housing balance is statistically significant with a 0.29 to 0.35 percent reduction in VMT for a 1 percent improvement in jobs-housing balance.

Table 1: Jobs-Housing Balance and VMT

Study	Study Location	Study Year(s)	Results	
			Effect Type	***Effect Size***
Nowlan and Stewart (1991)	Downtown Toronto Central Area	1975-1988 cordon survey data	For each 100 additional dwelling units in the Central Area	Reduction of approximately 120 inbound trips during the morning three-hour rush period
			For each 100 additional Central Area residents	Reduction of approximately 70 inbound trips during the morning three-hour rush period
Frank and Pivo (1994)	Puget Sound area, Washington State	1989 travel survey data	Compare balanced census tracts (those with a jobs-to-households ratio of 0.8 to 1.2) and unbalanced tracts	0.29% reduction in average commute length (6.9 versus 9.6 miles) in balanced versus unbalanced tracts
Kockelman (1997)	San Francisco Bay Area	1990 travel survey data	1% increase of all jobs within a 30 minute radius by car of one's residence	0.31% reduction in total vehicle kilometers traveled (VKT) per household
			1% increase of all jobs within a 30 minute radius by car of one's residence	0.35% reduction in non-work VKT per household
Peng (1997)	Portland, Oregon metropolitan area	1988 transport survey data	Ratio of jobs to housing units within a 5-7 mile radius of each traffic analysis zone	Only extreme ratio (less than 1.2 or larger than 2.8) has a noticeable effect on total VMT
Miller and Ibrahim (1998)	The greater Toronto area	1986 transport survey data	Ratio of employment to population within 5 km of each residential zone's centroid	No significant effect on commute VKT

Study	Study Location	Study Year(s)	Results	
Cervero and Duncan (2006)	San Francisco Bay Area	2000 travel diary data	1% increase in the number of total jobs within 4 miles of one's residence	0.299% reduction in commute VMT
			1% increase in the number of jobs in the same occupational category within 4 miles of one's residence	0.329% reduction in commute VMT

Table 2: Excess Commuting Studies, Jobs-Housing Match, and VMT

Study	Study Location	Study Year(s)	Results
Yang (2008)	Boston and Atlanta	Census Transport Planning Packages (CTPP) for 1980,1990, and 2000	In Atlanta, a 1 km increase in "skills mismatch" is associated with a 0.67 km increase in actual commuting distance In Boston, "skills mismatch" did not have significant impact on actual commuting distance
Schleith and Horner (2014)	Tallahassee, Florida	Census Longitudinal Employer – Household Dynamics (LEHD), 2006-2011	Four job centers were identified in Tallahassee, and for commuters into those job centers "excess commute" was calculated as a measure of the difference between the observed commute distance and the minimum possible commute distance given the location of residences and jobs in the study area. High income workers (> $40,000 per year) had excess commute = 32.9%, Medium income workers ($15,000 - $40,000 per year) had excess commute = 52.1%, Low income workers (< $15,000 per year) had excess commute = 56.9%.

Note that while most of the studies in Table 1 use ratios of jobs and housing, the studies in Table 2 give insights into skill mismatch which are based on a measure of excess commuting. Yang (2008) finds evidence that skills mismatches increase commuting distances in Atlanta but not in Boston. The study by Schleith and Horner (2014) uses a measure of excess commuting for three different income groups. Excess commuting compares actual travel distances, averaged or summed for a city or metropolitan area, to the minimum travel distance required if all residents worked in the nearest available job. See the technical background document that accompanies this policy brief for more details on the methods in Yang (2008) and Schleith and Horner (2014).

Evidence Quality

Cervero and Duncan (2006) and Kockelman (1997) used micro-data from travel diaries, regressing individual or household VMT on land use measures (including jobs-housing balance metrics) plus variables that controlled for household income and survey respondent gender, age, and ethnicity among other demographic characteristics. Those studies are more sophisticated than studies that used data aggregated to census tracts or other geographic areas (e.g. Miller and Ibrahim, 1998 or Peng, 1997). Aggregate data obscure behavioral impacts at the household level and reduce the ability to control for sociodemographic characteristics. Frank and Pivo (1994) also aggregated their data into census tracts, with a result based on comparisons of tracts without controlling for household characteristics. It therefore shares the shortcomings of aggregation that is present in the Miller and Ibrahim (1998) and Peng (1997) studies. Overall, the studies based on disaggregate data, Cervero and Duncan (2006) and Kockelman (1997) in particular, are superior and represent the basis of the results in this brief.

Caveats

The evidence on jobs-housing balance summarized here overlaps in some ways with the evidence summarized in the policy brief on regional accessibility (see http://arb.ca.gov/cc/sb375/policies/policies.htm). The two ideas, while related, are not the same. Jobs-housing balance policies attempt to shorten commute distances, while regional accessibility should affect all travel by placing a broad range of origins and destinations closer together. Also, jobs-housing balance operates over a smaller spatial scale than regional accessibility; most of the papers in Table 1 measure jobs-housing balance for a distance of approximately four miles, while regional accessibility is typically measured for an entire metropolitan area. Yet both jobs-housing balance and regional accessibility are often operationalized by measuring the number of jobs within a particular distance from residential locations. For that reason, policies that improve both jobs-housing balance and regional accessibility will produce impacts that are *less* than the sum of the two effect sizes added together. How much less has not been studied, and given that the two policies differ, careful application of both jobs-housing balance and regional accessibility approaches might have larger effects than simply focusing on one policy or the other. A recent study funded by the Air Resources Board examined the impact of job accessibility within 5 miles and beyond 5 miles from a person's residence and found that in land use types that range from urban locations with poor transit to single family suburbs (roughly inner and outer suburbs), job access within five miles was an important determinant of VMT (Salon, 2014).

Some authors have argued that jobs-housing balances and imbalances are temporary, because over time jobs will move to the suburbs to follow markets and labor supply, bringing previously job-poor places into better balance (e.g. Giuliano, 1991). While this point is well taken, questions of job-skill match (see, e.g., Weitz, 2003 for a policy discussion) and fine grained patterns of job-housing balances or imbalances may remain.

Greenhouse Gas Emissions

The literature mentions that jobs-housing balance can reduce VMT, and therefore GHG emissions, but there are no quantitative GHG estimates based on original travel studies. This is likely because the bulk of the jobs-housing balance literature pre-dates the policy focus on GHG emissions. Some studies have based their estimates on agency reports that are no longer available. For example, Ewing (2008) cites a 1991 *Regional Growth Management Strategy* conducted by the San Diego Association of Governments (SANDAG), which concluded that promoting jobs-housing balance could reduce VMT from 5 to 9 percent in the San Diego region while only decreasing GHG emissions by less than 2 percent. The gap was due to vehicle emissions are disproportionately from auto cold starts, so eliminating trips would have a larger GHG reduction effect than shortening trips. Overall, more research is needed to link from the VMT reduction evidence in Table 1 to estimates of GHG reduction.

Co-Benefits

When the concept of jobs-housing balance originated in the late 1980s, congestion reduction was the primary goal (Cervero, 1989). Other co-benefits could include reduced need for new road construction through compact development (Weitz, 2003), improved air quality associated with VMT reduction, and if jobs-housing balance were achieved by reducing barriers to lower cost housing, possibly reductions in residential segregation by race or class (Cervero, 1989 and 1996).

Jobs-housing match, as opposed to simpler concepts of jobs-housing balance, relates to questions of whether affordable housing is available near low-income jobs. Schleith and Horner (2014) offer some insights from recent research in Tallahassee, Florida. They calculated a measure of “excess commute” for three income groups. They found that the highest income group (income > $40,000 per year) had the lowest excess commute, implying that the high income group had commutes that are closer to a theoretical minimum commute distance if every worker lived in existing housing that was as close as possible to their job. This suggests that the high income group either had more housing options near their workplace or were more willing or able to choose available housing options near work, compared to the low and medium income groups. The Schleith and Horner (2014) results suggest that in Tallahassee, low and medium income residents (those earning less than $40,000 per year) may face more constraints and hence are less able to choose housing near their workplace, although we caution that Schleith and Horner (2014) do not investigate the reason for the differences in excess commuting by income group. Given the size of Leon County (which contains Tallahassee), with a population of 275,487 in 2010, this result might apply best to similarly sized counties in, for example, California’s central valley.

Examples

In 2000, California Assembly Bill 2864 was passed, which, along with associated

legislative efforts (e.g. Proposition 46, 2002), provided funds for integrated jobs-housing balance planning efforts within eight metropolitan areas (called the Inter-Regional Partnership program, or IRP). It also provided competitive grant funding to municipalities to support local public-benefit capital projects associated with increases in housing units (the Jobs-Housing Balance Incentive Grant program). Both programs were administered by the California Department of Housing and Community Development (HCD). IRP projects included applications of scenario planning and land use – transportation modeling tools (see California HCD, 2005). The incentive grant program encouraged housing production by providing grant funding to cities (see California HCD, 2007). As funding for both programs has been fully allocated, these programs represent past efforts that illustrate methods the State has used to incentivize regional coordination to improve jobs-housing balance.

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